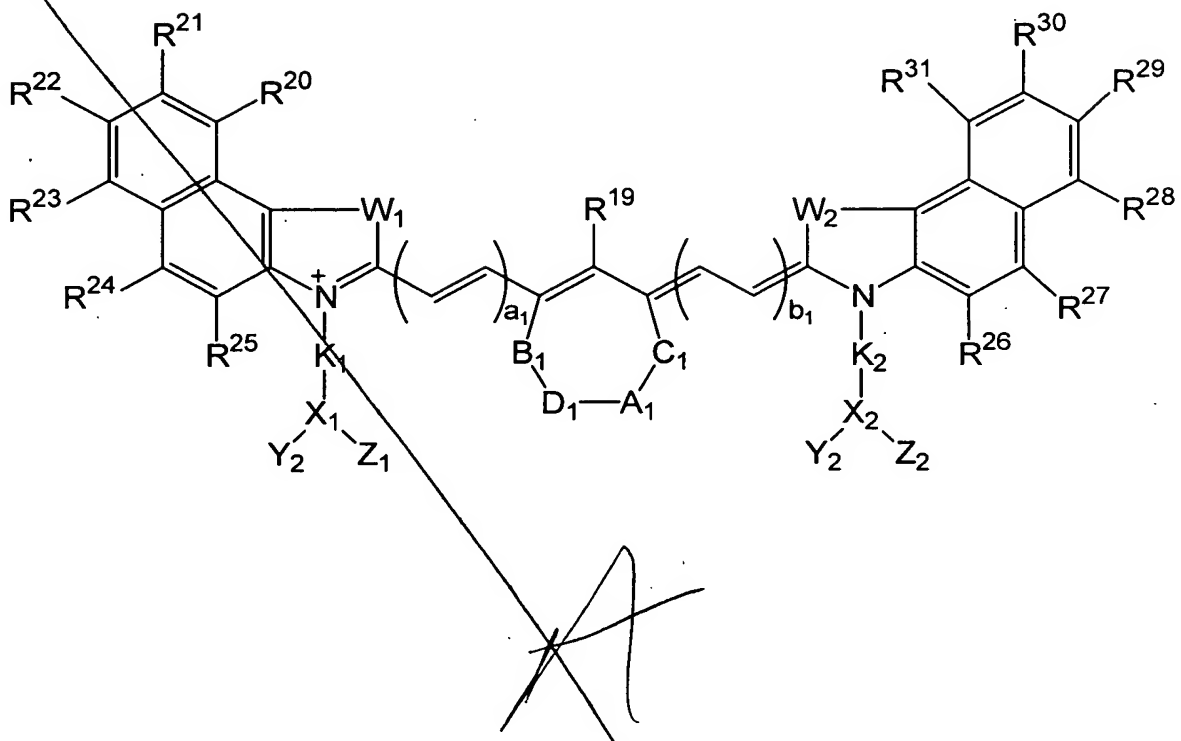
What is claimed is:

1. A composition comprising carbocyanine dye bioconjugate of formula 4



wherein W_1 and W_2 may be the same or different and are selected from the group consisting of $-CR^{10}R^{11}$, -O-, $-NR^{12}$, -S-, and –Se; Y_1, Y_2, Z_1, and Z_2 are independently selected from the group consisting of hydrogen, tumor-specific agent, phototherapy agent, -CONH-Bm, -NHCO-Bm, $-(CH_2)_a$-CONH-Bm, $-CH_2-(CH_2OCH_2)_b-CH_2$-CONH-Bm, $-(CH_2)_a$-NHCO-Bm, $-CH_2-(CH_2OCH_2)_b-CH_2$-NHCO-Bm, $-(CH_2)_a-N(R^{12})-(CH_2)_b$-CONH-Bm, $-(CH_2)_a-N(R^{12})-(CH_2)_c$-NHCO-Bm, $-(CH_2)_a-N(R^{12})-CH_2-(CH_2OCH_2)_b-CH_2$-CONH-Bm, $-(CH_2)_a-N(R^{12})-CH_2-(CH_2OCH_2)_b-CH_2$-NHCO-Bm, $-CH_2-(CH_2OCH_2)_b-CH_2-N(R^{12})-(CH_2)_a$-CONH-Bm, $-CH_2-(CH_2OCH_2)_b-CH_2-N(R^{12})-(CH_2)_a$-NHCO-Bm, $-CH_2-(CH_2OCH_2)_b-CH_2-N(R^{12})-CH_2-(CH_2OCH_2)_d-CONH$-Bm, $-CH_2-(CH_2OCH_2)_b-CH_2-N(R^{12})-CH_2-(CH_2OCH_2)_d$-NHCO-Bm, -CONH-

Dm, -NHCO-Dm, -$(CH_2)_a$-CONH-Dm, -CH_2-$(CH_2OCH_2)_b$-CH_2-CONH-Dm, -$(CH_2)_a$-NHCO-Dm, -CH_2-$(CH_2OCH_2)_b$-CH_2-NHCO-Dm, -$(CH_2)_a$-$N(R^{12})$-$(CH_2)_b$-CONH-Dm, -$(CH_2)_a$-$N(R^{12})$-$(CH_2)_c$-NHCO-Dm, -$(CH_2)_a$-$N(R^{12})$-CH_2-$(CH_2OCH_2)_b$-CH_2-CONH-Dm, -$(CH_2)_a$-$N(R^{12})$-CH_2-$(CH_2OCH_2)_b$-CH_2-NHCO-Dm, -CH_2-$(CH_2OCH_2)_b$-CH_2-$N(R^{12})$-$(CH_2)_a$-CONH-Dm, -CH_2-$(CH_2OCH_2)_b$-CH_2-$N(R^{12})$-$(CH_2)_a$-NHCO-Dm, -CH_2-$(CH_2OCH_2)_b$-CH_2-$N(R^{12})$-CH_2-$(CH_2OCH_2)_d$-CONH-Dm, -CH_2-$(CH_2OCH_2)_b$-CH_2-$N(R^{12})$-CH_2-$(CH_2OCH_2)_d$-NHCO-Dm, -$(CH_2)_a$-N $R^{12}R^{13}$, and -$CH_2(CH_2OCH_2)_b$-CH_2N $R^{12}R^{13}$; K_1 and K_2 are independently selected from the group consisting of C_1-C_{30} alkyl, C_5-C_{30} aryl, C_1-C_{30} alkoxyl, C_1-C_{30} polyalkoxyalkyl, C_1-C_{30} polyhydroxyalkyl, C_5-C_{30} polyhydroxyaryl, C_1-C_{30} aminoalkyl, saccharide, peptide, -$CH_2(CH_2OCH_2)_b$-CH_2-, -$(CH_2)_a$-CO-, -$(CH_2)_a$-CONH-, -CH_2-$(CH_2OCH_2)_b$-CH_2-CONH-, -$(CH_2)_a$-NHCO-, -CH_2-$(CH_2OCH_2)_b$-CH_2-NHCO-, -$(CH_2)_a$-O-, and -CH_2-$(CH_2OCH_2)_b$-CO-; X_1 and X_2 are single bonds, or are independently selected from the group consisting of nitrogen, saccharide, -CR^{14}-, -$CR^{14}R^{15}$, -$NR^{16}R^{17}$; C_5 – C_{30} aryl; Q is a single bond or is selected from the group consisting of -O-, -S-, -Se-, and –NR^{18}; A_1 is a single or a double bond; B_1, C_1, and D_1 are independently selected from the group consisting of -O-, -S-, -Se-, -P-, -$CR^{10}R^{11}$, -CR^{11}, alkyl, NR^{12}, and -C=O; A_1, B_1, C_1, and D_1 may together form a 6- to 12-membered carbocyclic ring or a 6- to 12-membered heterocyclic ring optionally containing one or more oxygen, nitrogen, or sulfur atom; a_1 and b_1 independently vary from 0 to 5; R^{10} to R^{13}, and R^{18} to R^{31} are independently selected from the group consisting of hydrogen, C_1-C_{10} alkyl, C_5-C_{20} aryl, C_1-C_{10} alkoxyl, C_1-C_{10} polyalkoxyalkyl, C_1-C_{20} polyhydroxyalkyl, C_5-C_{20} polyhydroxyaryl, C_1-C_{10} aminoalkyl, cyano, nitro, halogen, saccharide, peptide, -$CH_2(CH_2OCH_2)_b$-CH_2-OH, -$(CH_2)_a$-CO_2H, -$(CH_2)_a$-CONH-Bm, -CH_2-

$(CH_2OCH_2)_b$-CH_2-CONH-Bm, -$(CH_2)_a$-NHCO-Bm, -CH_2-$(CH_2OCH_2)_b$-CH_2-NHCO-Bm, -$(CH_2)_a$-OH and -CH_2-$(CH_2OCH_2)_b$-CO_2H; R^{14} to R^{17} are independently selected from the group consisting of hydrogen, C_1-C_{10} alkyl, C_5-C_{20} aryl, C_1-C_{10} alkoxyl, C_1-C_{10} polyalkoxyalkyl, C_1-C_{20} polyhydroxyalkyl, C_5-C_{20} polyhydroxyaryl, C_1-C_{10} aminoalkyl, saccharide, peptide, -$CH_2(CH_2OCH_2)_b$-CH_2-, -$(CH_2)_a$-CO-, -$(CH_2)_a$-CONH-, -CH_2-$(CH_2OCH_2)_b$-CH_2-CONH-, -$(CH_2)_a$-NHCO-, -CH_2-$(CH_2OCH_2)_b$-CH_2-NHCO-, -$(CH_2)_a$-O-, and -CH_2-$(CH_2OCH_2)_b$-CO-; Bm and Dm are independently selected from the group consisting of bioactive peptide, protein, cell, antibody, antibody fragment, saccharide, glycopeptide, peptidomimetic, drug, drug mimic, hormone, metal chelating agent, radioactive or nonradioactive metal complex, echogenic agent, photoactive molecule, and phototherapy agent; a and c independently vary from 1 to 20; b and d independently vary from 1 to 100.

2. The compound of claim 1 wherein W_1 and W_2 are independently selected from the group consisting of -$C(CH_3)_2$, -$C((CH_2)_aOH)CH_3$, -$C((CH_2)_aOH)_2$, -$C((CH_2)_aCO_2H)CH_3$, -$C((CH_2)_aCO_2H)_2$, -$C((CH_2)_aNH_2)CH_3$, $C((CH_2)_aNH_2)_2$, $C((CH_2)_aNR^{12}R^{13})_2$, -$NR^{12}$, and -S-; Y_1 and Y_2 are selected from the group consisting of hydrogen, tumor-specific agent, -CONH-Bm, -NHCO-Bm, -$(CH_2)_a$-CONH-Bm, -CH_2-$(CH_2OCH_2)_b$-CH_2-CONH-Bm, -$(CH_2)_a$-NHCO-Bm, -CH_2-$(CH_2OCH_2)_b$-CH_2-NHCO-Bm, -$(CH_2)_a$-$NR^{12}R^{13}$, and -$CH_2(CH_2OCH_2)_b$-$CH_2NR^{12}R^{13}$; Z_1 and Z_2 are independently selected from the group consisting of hydrogen, phototherapy agent, -CONH-Dm, -NHCO-Dm, -$(CH_2)_a$-CONH-Dm, -CH_2-$(CH_2OCH_2)_b$-CH_2-CONH-Dm, -$(CH_2)_a$-NHCO-Dm, -CH_2-$(CH_2OCH_2)_b$-CH_2-NHCO-Dm, -$(CH_2)_a$-N $R^{12}R^{13}$, and -$CH_2(CH_2OCH_2)_b$-CH_2N $R^{12}R^{13}$; K_1 and K_2 are

independently selected from the group consisting of C_1-C_{10} alkyl, C_5-C_{20} aryl, C_1-C_{20} alkoxyl, C_1-C_{20} aminoalkyl, $-(CH_2)_a-CO-$, $-(CH_2)_a-CONH$, $-CH_2-(CH_2OCH_2)_b-CH_2-CONH-$, $-(CH_2)_a-NHCO-$, $-CH_2-(CH_2OCH_2)_b-CH_2-NHCO-$, and $-CH_2-(CH_2OCH_2)_b-CO-$; X_1 and X_2 are single bonds, or are independently selected from the group consisting of nitrogen, $-CR^{14}-$, $-CR^{14}R^{15}$, and $-NR^{16}R^{17}$; A_1 is a single or a double bond; B_1, C_1, and D_1 are independently selected from the group consisting of -O-, -S, $-CR^{11}$, alkyl, $-NR^{12}$, and -C=O; A_1, B_1, C_1, and D_1 may together form a 6- to 12-membered carbocyclic ring or a 6- to 12-membered heterocyclic ring optionally containing one or more oxygen, nitrogen, or sulfur atom; a_1 and b_1 independently vary from 0 to 3; Bm is selected from the group consisting of bioactive peptide containing 2 to 30 amino acid units, protein, antibody fragment, mono- and oligosaccharide; bioactive peptide, protein, and oligosaccharide; Dm is selected from the group consisting of photosensitizer, photoactive molecule, and phototherapy agent; a and c independently vary from 1 to 20; b and d independently vary from 1 to 100.

3. The composition of claim 2 wherein each W^1 and W^2 is $-C(CH_3)_2$; each K_1 and K_2 is $-(CH_2)_4CO-$; each X_1 and X_2 is a single bond; A_1 is a single bond; each B_1, C_1, and D_1 is $-CH_2-$; R^{19} is Cl; each R^{20} to R^{31}, Y_1 and Z_1 is H; Y_2 is a tumor-specific agent; and Z_2 is a phototherapy agent.

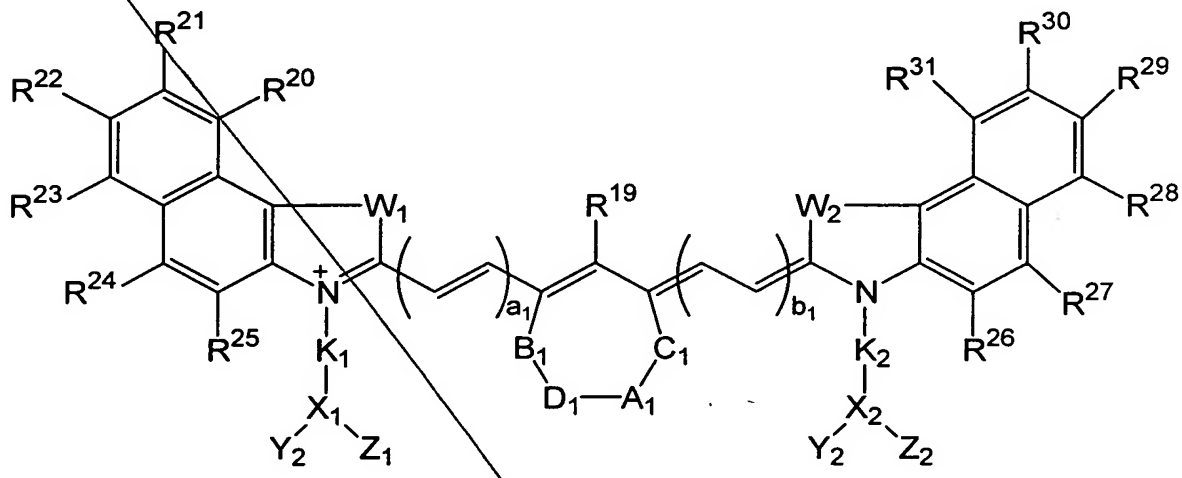
4. The compound according to claim 3 wherein the said tumor-specific agent is a bioactive peptide containing 2 to 30 amino acid units.

5. The compound according to claim 4 wherein the said tumor-specific agent is octreotate and bombesin (7-14).

6. The compound according to claim 3 wherein the said phototherapy agent is a photosensitizer.

7. The compound according to claim 6 wherein the said photosensitizer is 2-[1-hexyloxyethyl]-2-devinylpyropheophorbide-a.

8. A method for performing a diagnostic and therapeutic procedure comprising administering to an individual an effective amount of the composition of cyanine dye bioconjugate of Formula 4



wherein W_1 and W_2 may be the same or different and are selected from the group consisting of $-CR^{10}R^{11}$, -O-, $-NR^{12}$, -S-, and –Se; Y_1, Y_2, Z_1, and Z_2 are independently selected from the group consisting of hydrogen, tumor-specific agent, phototherapy agent, -CONH-Bm, -NHCO-Bm, $-(CH_2)_a$-CONH-Bm, $-CH_2-(CH_2OCH_2)_b-CH_2$-CONH-Bm, $-(CH_2)_a$-NHCO-Bm, $-CH_2-(CH_2OCH_2)_b-CH_2$-NHCO-Bm, $-(CH_2)_a-N(R^{12})-(CH_2)_b$-CONH-Bm, $-(CH_2)_a-N(R^{12})-(CH_2)_c$-NHCO-Bm, $-(CH_2)_a-N(R^{12})-CH_2-(CH_2OCH_2)_b-CH_2$-CONH-Bm, $-(CH_2)_a-N(R^{12})-CH_2-(CH_2OCH_2)_b-CH_2$-NHCO-Bm, $-CH_2-(CH_2OCH_2)_b-CH_2-N(R^{12})-(CH_2)_a$-CONH-Bm, $-CH_2-(CH_2OCH_2)_b-CH_2-N(R^{12})-(CH_2)_a$-NHCO-Bm, $-CH_2-(CH_2OCH_2)_b-CH_2-N(R^{12})-CH_2-(CH_2OCH_2)_d-$

CONH-Bm, $-CH_2-(CH_2OCH_2)_b-CH_2-N(R^{12})-CH_2-(CH_2OCH_2)_d-NHCO-Bm$, -CONH-Dm, -NHCO-Dm, $-(CH_2)_a-CONH-Dm$, $-CH_2-(CH_2OCH_2)_b-CH_2-CONH-Dm$, $-(CH_2)_a-NHCO-Dm$, $-CH_2-(CH_2OCH_2)_b-CH_2-NHCO-Dm$, $-(CH_2)_a-N(R^{12})-(CH_2)_b-CONH-Dm$, $-(CH_2)_a-N(R^{12})-(CH_2)_c-NHCO-Dm$, $-(CH_2)_a-N(R^{12})-CH_2-(CH_2OCH_2)_b-CH_2-CONH-Dm$, $-(CH_2)_a-N(R^{12})-CH_2-(CH_2OCH_2)_b-CH_2-NHCO-Dm$, $-CH_2-(CH_2OCH_2)_b-CH_2-N(R^{12})-(CH_2)_a-CONH-Dm$, $-CH_2-(CH_2OCH_2)_b-CH_2-N(R^{12})-(CH_2)_a-NHCO-Dm$, $-CH_2-(CH_2OCH_2)_b-CH_2-N(R^{12})-CH_2-(CH_2OCH_2)_d-CONH-Dm$, $-CH_2-(CH_2OCH_2)_b-CH_2-N(R^{12})-CH_2-(CH_2OCH_2)_d-NHCO-Dm$, $-(CH_2)_a-N\,R^{12}R^{13}$, and $-CH_2(CH_2OCH_2)_b-CH_2N\,R^{12}R^{13}$; K_1 and K_2 are independently selected from the group consisting of C_1-C_{30} alkyl, C_5-C_{30} aryl, C_1-C_{30} alkoxyl, C_1-C_{30} polyalkoxyalkyl, C_1-C_{30} polyhydroxyalkyl, C_5-C_{30} polyhydroxyaryl, C_1-C_{30} aminoalkyl, saccharide, peptide, $-CH_2(CH_2OCH_2)_b-CH_2-$, $-(CH_2)_a-CO-$, $-(CH_2)_a-CONH-$, $-CH_2-(CH_2OCH_2)_b-CH_2-CONH-$, $-(CH_2)_a-NHCO-$, $-CH_2-(CH_2OCH_2)_b-CH_2-NHCO-$, $-(CH_2)_a-O-$, and $-CH_2-(CH_2OCH_2)_b-CO-$; X_1 and X_2 are single bonds, or are independently selected from the group consisting of nitrogen, saccharide, $-CR^{14}-$, $-CR^{14}R^{15}$, $-NR^{16}R^{17}$; $C_5 - C_{30}$ aryl; Q is a single bond or is selected from the group consisting of -O-, -S-, -Se-, and $-NR^{18}$; A_1 is a single or a double bond; B_1, C_1, and D_1 are independently selected from the group consisting of -O-, -S-, -Se-, -P-, $-CR^{10}R^{11}$, $-CR^{11}$, alkyl, $-NR^{12}$, and -C=O; A_1, B_1, C_1, and D_1 may together form a 6- to 12-membered carbocyclic ring or a 6- to 12-membered heterocyclic ring optionally containing one or more oxygen, nitrogen, or sulfur atom; a_1 and b_1 independently vary from 0 to 5; R^{10} to R^{13}, and R^{18} to R^{31} are independently selected from the group consisting of hydrogen, C_1-C_{10} alkyl, C_5-C_{20} aryl, C_1-C_{10} alkoxyl, C_1-C_{10} polyalkoxyalkyl, C_1-C_{20} polyhydroxyalkyl, C_5-C_{20} polyhydroxyaryl, C_1-C_{10} aminoalkyl, cyano, nitro, halogen, saccharide,

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peptide, $-CH_2(CH_2OCH_2)_b-CH_2-OH$, $-(CH_2)_a-CO_2H$, $-(CH_2)_a-CONH-Bm$, $-CH_2-(CH_2OCH_2)_b-CH_2-CONH-Bm$, $-(CH_2)_a-NHCO-Bm$, $-CH_2-(CH_2OCH_2)_b-CH_2-NHCO-Bm$, $-(CH_2)_a-OH$ and $-CH_2-(CH_2OCH_2)_b-CO_2H$; R^{14} to R^{17} are independently selected from the group consisting of hydrogen, C_1-C_{10} alkyl, C_5-C_{20} aryl, C_1-C_{10} alkoxyl, C_1-C_{10} polyalkoxyalkyl, C_1-C_{20} polyhydroxyalkyl, C_5-C_{20} polyhydroxyaryl, C_1-C_{10} aminoalkyl, saccharide, peptide, $-CH_2(CH_2OCH_2)_b-CH_2-$, $-(CH_2)_a-CO-$, $-(CH_2)_a-CONH$, $-CH_2-(CH_2OCH_2)_b-CH_2-CONH-$, $-(CH_2)_a-NHCO-$, $-CH_2-(CH_2OCH_2)_b-CH_2-NHCO-$, $-(CH_2)_a-O-$, and $-CH_2-(CH_2OCH_2)_b-CO-$; Bm and Dm are independently selected from the group consisting of bioactive peptide, protein, cell, antibody, antibody fragment, saccharide, glycopeptide, peptidomimetic, drug, drug mimic, hormone, metal chelating agent, radioactive or nonradioactive metal complex, echogenic agent, photoactive molecule, and phototherapy agent; a and c independently vary from 1 to 20; b and d independently vary from 1 to 100; and

thereafter, performing said procedure.

9. The method for performing the diagnostic and therapeutic procedure of claim 8 which comprises administering to an individual an effective amount of the composition of cyanine dye bioconjugate wherein W_1 and W_2 are independently selected from the group consisting of $-C(CH_3)_2$, $-C((CH_2)_aOH)CH_3$, $-C((CH_2)_aOH)_2$, $-C((CH_2)_aCO_2H)CH_3$, $-C((CH_2)_aCO_2H)_2$, $-C((CH_2)_aNH_2)CH_3$, $-C((CH_2)_aNH_2)_2$, $-C((CH_2)_aNR^{12}R^{13})_2$, $-NR^{12}$, and -S-; Y_1 and Y_2 are selected from the group consisting of hydrogen, tumor-specific agent, -CONH-Bm, -NHCO-Bm, $-(CH_2)_a-CONH-Bm$, $-CH_2-(CH_2OCH_2)_b-CH_2-CONH-Bm$, $-(CH_2)_a-NHCO-Bm$, $-CH_2-(CH_2OCH_2)_b-CH_2-NHCO-Bm$, $-(CH_2)_a-NR^{12}R^{13}$, and

$-CH_2(CH_2OCH_2)_b-CH_2NR^{12}R^{13}$; Z_1 and Z_2 are independently selected from the group consisting of hydrogen, phototherapy agent, -CONH-Dm, -NHCO-Dm, $-(CH_2)_a$-CONH-Dm, $-CH_2-(CH_2OCH_2)_b-CH_2$-CONH-Dm, $-(CH_2)_a$-NHCO-Dm, $-CH_2-(CH_2OCH_2)_b-CH_2$-NHCO-Dm, $-(CH_2)_a$-N $R^{12}R^{13}$, and $-CH_2(CH_2OCH_2)_b-CH_2N$ $R^{12}R^{13}$; K_1 and K_2 are independently selected from the group consisting of C_1-C_{10} alkyl, C_5-C_{20} aryl, C_1-C_{20} alkoxyl, C_1-C_{20} aminoalkyl, $-(CH_2)_a$-CO-, $-(CH_2)_a$-CONH-, $-CH_2-(CH_2OCH_2)_b-CH_2$-CONH-, $-(CH_2)_a$-NHCO-, $-CH_2-(CH_2OCH_2)_b-CH_2$-NHCO-, and $-CH_2-(CH_2OCH_2)_b$-CO-; X_1 and X_2 are single bonds, or are independently selected from the group consisting of nitrogen, $-CR^{14}$-, $-CR^{14}R^{15}$, and $-NR^{16}R^{17}$; A_1 is a single or a double bond; B_1, C_1, and D_1 are independently selected from the group consisting of -O-, -S, $-CR^{11}$, alkyl, $-NR^{12}$, and -C=O; A_1, B_1, C_1, and D_1 may together form a 6- to 12-membered carbocyclic ring or a 6- to 12-membered heterocyclic ring optionally containing one or more oxygen, nitrogen, or sulfur atom; a_1 and b_1 independently vary from 0 to 3; Bm is selected from the group consisting of bioactive peptide containing 2 to 30 amino acid units, protein, antibody fragment, mono- and oligosaccharide; bioactive peptide, protein, and oligosaccharide; Dm is selected from the group consisting of photosensitizer, photoactive molecule, and phototherapy agent; a and c independently vary from 1 to 20; b and d independently vary from 1 to 100.

10. The method for performing the diagnostic and therapeutic procedure of claim 9 comprising administering to an individual an effective amount of the composition of cyanine dye bioconjugate wherein each W^1 and W^2 is $-C(CH_3)_2$; each K_1 and K_2 is $-(CH_2)_4CO$-; each X_1 and X_2 is a single bond;

A_1 is a single bond; each B_1, C_1, and D_1 is $-CH_2-$; R^{19} is Cl; each R^{20} to R^{31}, Y_1 and Z_1 is H; Y_2 is a tumor-specific agent; and Z_2 is a phototherapy agent.

11. The method for performing the diagnostic and therapeutic procedure of claim 10 comprising administering to an individual an effective amount of the composition of cyanine dye bioconjugate wherein the said tumor-specific agent is a bioactive peptide containing 2 to 30 amino acid units.

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12. The method for performing the diagnostic and therapeutic procedure of claim 11 comprising administering to an individual an effective amount of the composition of cyanine dye bioconjugate wherein the said tumor-specific agent is octreotate and bombesin (7-14).

13. The method for performing the diagnostic and therapeutic procedure of claim 10 comprising administering to an individual an effective amount of the composition of cyanine dye bioconjugate wherein the said phototherapy agent is a photosensitizer.

14. The method for performing the diagnostic and therapeutic procedure of claim 13 comprising administering to an individual an effective amount of the composition of cyanine dye bioconjugate wherein the said photosensitizer is 2-[1-hexyloxyethyl]-2-devinylpyropheophorbide-a.

15. The method of claim 8 wherein said procedure utilizes light of wavelength in the region of 300-1300 nm.

16. The method of claim 8 wherein the diagnostic procedure is optical tomography.

17. The method of claim 8 wherein said diagnostic procedure is fluorescence endoscopy.

18. The method of claim 8 wherein said procedure further comprises a step of imaging and therapy wherein said imaging and therapy is selected from the group consisting of absorption, light scattering, photoacoustic and sonofluoresence technique.

19. The method of claim 8 wherein said procedure is for diagnosing and treating atherosclerotic plaques and blood clots.

20. The method of claim 8 wherein said procedure comprises administering localized therapy.

21. The method of claim 8 wherein said therapeutic procedure comprises photodynamic therapy.

22. The method of claim 8 wherein said therapeutic procedure comprises laser assisted guided surgery (LAGS) for the detection and treatment of micrometastases.